ON THE

SERVICE RENDERED TO MANKIND

BY

MEDICAL SCIENCE:

A

GRADUATION ADDRESS

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BY

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ON THE SERVICE RENDERED TO MANKIND BY MEDICAL SCIENCE.

Bachelors of Medicine and Masters of Surgery,—On this occasion I am called upon by my colleagues to congratulate you on having brought your student days to a successful close. We offer you our hearty congratulations on having without a shadow of favour, and by dint of your own ability and application to study, won the place you now hold as graduates of our University and members of the medical profession.

Who of us can look back on our graduation day without feeling it was the first day of a new epoch in our lives. We felt as if released from the heavy chains of study, and with recovered elasticity we stepped into the wider world of professional life buoyant with hope and expectation. Every graduate of to-day feels as if he had reached the summit of a steep ascent. He rests a while, but with a feeling that having proved himself equal so far to the arduous task set before him, he can look forward with confidence to the greater effort that still awaits him.

You have come to this seat of learning from all quarters of the globe, and having learned the principles and practice of Medicine and Surgery, many of you are about to depart to the distant lands of your birth. You meet to-day for the last time those who have been your fellow-students and your teachers, and ere we part, I have, in the name of the University, to wish you all good-speed, and the full measure of success that is certain to fall to the lot of every one of you who faithfully discharges his duty. As you travel to your distant homes, perhaps with some feeling of suspense regarding the future, dispel your anxiety and look hopefully forward. Be assured that the messengers of the healing art are ever welcome, and those who are sufficiently learned and diligent are ever in demand.

Doctors of Medicine,—We have to congratulate you on the successful establishment of your claim to the higher degree now conferred upon you. The proofs of your title to the degree of Doctor furnished in your *theses* have in this as in other years

convinced us that amongst our graduates we have every year men of high talent, able to investigate difficult problems, eager to research, and anxious to contribute to the advancement of medical science. We have to congratulate those whose theses have been found worthy of special marks of commendation, and more especially those who have gained medals. One has only to scan the list of thesis medallists in past years to perceive that medals obtained for original research are sure tokens of future eminence. On this day one and twenty years ago Dr Ferrier received a medal for his thesis on "The Comparative Anatomy of the Corpora Quadrigemina," a subject of research suggested to him by the present speaker, and which became the stepping-stone to those important researches on the localization of sensory and motor centres in the brain which have so greatly advanced our knowledge of the physiology and pathology of that organ, and have been so great a help in medical and surgical diagnosis. As one of our most distinguished graduates, and as a researcher who has greatly contributed to the advancement of medical science, we welcome him back to his *Alma Mater*, and congratulate him on his having received the Cameron Prize.

Gentlemen,—Let me now place before you a brief outline of the service rendered to mankind by medical science. I trust the announcement of so vast a subject may not alarm you. I shall not do more than trace an outline, and I shall endeavour to render myself intelligible to the non-medical graduates and to your friends who have come here to witness your graduation. I need hardly remind you that there has been no revelation regarding the nature of life and the causes of disease other than that afforded by the development of science. The old ideas of a pre-scientific age, so far from helping the human mind to apprehend the nature of disease, have scarcely even now ceased to hamper the progress of medicine. In the primitive period of human life the imaginative faculty confidently offered to explain the causes of events. It was natural enough to regard the roll of thunder as the voice of an angry deity, for it resembled the deep toned roar of the lion in the forest; and when living things fell dead before the thunderbolt discharged from the frowning cloud, it was not unnatural to suppose that an angry Jupiter was discharging the fiery shafts of his vengeance on the inhabitants of earth. It was not difficult to imagine that when living things fell victims to a deadly pestilence it was sent from heaven to scourge man and beast. When the phenomena of life were confidently ascribed to good and evil spirits jealously contending for the mastery of mankind, it seemed not unreasonable to suppose that crazed men and women had fallen victims to the spirits of evil. The pages of history are blotted with the terrible results of these mistaken ideas. The fearful cruelty to which thousands of half crazed old women were subjected on the groundless fictions relating to witchcraft, the

barbarous treatment of the insane prevalent nearly to the close of the last century, show what a fearful scourge false ideas may be. Of course, it is easy for the enlightened century to complacently smile at the darker age; but we must never under-estimate the vast difficulty encountered by the human mind in groping its way amidst the complicated machinery of Nature, and striving to find the secret springs which science with her manifold methods alone could reveal.

To Greece we owe the initiation of that great movement by which the human intellect was emancipated from the fetters of Eastern and of Egyptian superstition. The Grecian mind boldly asserted its right to explain phenomena without regard to tradition, and to follow the argument whithersoever it might lead. It was in that spirit that Hippocrates urged his students to believe that all diseases spring from natural causes, and that none of them should be ascribed to visitation by the gods. That was the key-note of rational medicine, struck three and twenty centuries ago, but which had to be sounded again and again through many centuries ere his successors were brought into harmonious procession.

The grandest achievement of science is the establishment of the principle, that Nature works under fixed laws. We owe to Greece the fertile germ of that great conception which became the basis of all modern science. That great principle throws a flood of light on the past, and enables the mind in some measure to realize the splendid plan of creation, and to recognise the vanity of many of the ideas of an age when the laws of Nature were unknown to man. When the telescope penetrated the veil of distance and revealed the nature and movements of the solar system that led to the discovery of the law of gravitation, men paused in wonder at the simple majesty of a law that rules at once the smallest, the greatest, and the most distant masses of matter. When the microscope revealed the structure of plants and animals, and led to the discovery that all living organisms are developed by the multiplication and modification of cells, there again was an unexpectedly simple natural law of vast significance. There is nothing more interesting than to trace the successive stages in the development of one of the higher animals from the simple germ to the highly complex organism, and to perceive that all arise from the repeated division and modification of minute cells. That simple law of cellular development has linked together the whole world of plant and animal life in times present and past.

The sciences embraced in the Faculty of Medicine search out the laws of living Nature, the structure of living organisms, the activities they display, their modes of development, the conditions necessary for the attainment of their perfect state, the causes of failure, the nature of disease,—its prevention, its relief, its cure,—the means by which human life may be prolonged and untimely death avoided.

When we look into the history of the healing art, two facts stand out in striking contrast—the great antiquity of Medicine, and the comparatively recent period during which she has made her rapid advance. In Egypt 6000 years ago the earliest known book on human anatomy issued from the pen of a king. Anatomy had, therefore, a good start in the medical race, and it is not surprising that it should be the most advanced department of medical science. But although much skilful use of the scalpel was required to reveal the coarser structure of the body, it was a far more difficult task to ascertain the physiological functions of its parts. Although the structure of the heart and arrangement of the bloodvessels were known in the early period, this era had reached the 17th century before the circulation of the blood, the cause of the pulse, and the nature of the heart's action, were discovered. In the older time Surgery, no doubt, was able to render some mechanical help in cases of accident, hæmorrhage, and such like, but, of course, modern Surgery and Medicine date from the beginning of the 17th century, when Harvey made his great discovery of the circulation. The tardy discovery of the fact that the blood moves in a circle shows how long medical science had to wait before a comparatively simple problem relating to the movement of a fluid within a system of tubes could be solved.

But the motion of the blood is only a small part of the great process of nutrition, the real nature of which remained a mystery until Chemistry made her great revelations. It was not until 1774 that Priestley discovered oxygen and the composition of the atmosphere, and so revealed the secret of the old spirit of the air. Then for the first time it became possible to understand the nature of respiration and to enter the field of physiological chemistry. It was only in 1811 that Charles Bell discovered the different functions of the two roots of spinal nerves, and so gave the key to our knowledge of the functions of the nervous system. It was only in 1822 that the observations of Beaumont supplied our first real knowledge of the digestive process. It was only in 1839 that Schwann made his great discovery of the cellular structure and development of animal tissues, which is the foundation of microscopical anatomy and of cellular physiology and pathology. It was only in 1842 that Bowman advanced his theory of the action of the kidney. Although Stephen Hales measured the blood-pressure in 1740, it was not until 1847 that Ludwig introduced the graphic method of studying the circulation and other movements. It was only in 1849 that Bernard discovered the function of the pancreas, and only in 1853 that he discovered the glycogenic function of the liver, and vasomotor nerves. Therefore, if we except Harvey's discovery of the circulation, all the chief discoveries in microscopic anatomy, in the physiology and pathology of the tissues and organs, have been made in a century and a half, and, indeed, most of them within the present century.

In the world's history the 19th will ever be known as the great scientific century, when the human mind first gained its great mastery over the forces of Nature, and compelled her to reveal some of her greatest secrets. The sciences embraced in the Faculty of Medicine have made rapid progress, and rational or scientific medicine, as distinguished from the old empirical guessing and groping in the dark, is now fairly on the open highway of science, led by strictly scientific methods of inquiry, and ever gaining a deeper knowledge of living nature, and a more successful control of her powers. Only those who are intimately acquainted with the subtle character of the problems in physiology, pathology, and therapeutics that still await solution, can adequately comprehend why so much laborious research by so many minds is required to make even a little progress; and only the initiated can understand why Nature will ever hold secrets which the human mind can never penetrate.

Amongst the services rendered by medical science to mankind there is none greater than the discovery of anæsthetics. The idea of performing a surgical operation painlessly on a person in profound sleep is as old as the first chapter of Genesis. It was not until ether and chloroform emerged from the retort of the chemist that anæsthesia—sought after with indifferent success through many centuries—became at last the invaluable handmaid of Medicine. Anæsthesia has robbed surgery of its terror; the patient no longer shrinks from suffering; the surgeon no longer performs his delicate operations with precipitate haste, impelled by the thought that at every moment he is producing pain. Many a valuable life has come to an untimely end because the patient shrank from the thought of enduring the pain of an operation which might have saved his life by timely removal of his malady; and many a one, weakened by disease, has died during the operation or after, from shock to the nervous system produced by the pain. There can be no doubt that the use of anæsthetics has indirectly lessened the mortality from surgical diseases and operations. Those of us who long ago listened to the lectures of Sir James Simpson, remember well his reference to the prejudice he had to contend with when he introduced chloroform into his practice. In these times there is a loud cry of indignation if a medical man dare to inflict pain for a scientific purpose; but when Simpson dared to abolish the pains of child-birth by the administration of chloroform, he was accused of tampering with the predestined course of Nature,—so curious is the inconsistency of human prejudice.

In the practical departments of medicine Surgery has ever held a foremost place. The early study of anatomy and the mechanical nature of the surgeon's art enabled him to render greater help than the physician contending mainly with internal maladies. But it is only in quite recent times that Surgery has achieved her great success. The greatest advance of modern Surgery has undoubtedly

been in the treatment of wounds, especially those produced during surgical operations. The comparative safety with which these may now be performed is Surgery's chief triumph. The Edinburgh School of Medicine can claim the initiation of the modern method. The acute observation of Robert Liston and James Syme led them to perceive that Nature's method of healing a wound had not been rightly apprehended, and that the unenlightened efforts of the older surgeons had been a hindrance rather than a help to Nature. They banished the crude old dressings of wounds, and adopted the simple method of interfering with healthy living tissues as little as possible. But although remarkable success followed the adoption of their method, it required the addition of the antiseptic system, with which the name of Sir Joseph Lister will ever be associated.

One of the most interesting features of science is the suddenness with which side lights may be thrown on dark places from unexpected quarters. Louis Pasteur, a French chemist, turns his attention to yeast, and studies with keen insight the process of fermentation. Many would have smiled with incredulity had they been told that Pasteur's study of the yeast fungus would ere long lead to reform in the treatment of surgical wounds. But when it was discovered that the putrefaction of a sore is a fermentation induced by minute fungi analogous to yeast in their mode of action, Lister perceived that the surgeon must guard against putrefactive fungi, lest they defeat Nature's method of healing. Thus, from chemical and botanical research, the surgeon unexpectedly obtained the cue which has enabled him to almost entirely prevent the fatal blood poisoning apt to be engendered by the pernicious effects of bacteria on the juices of wounded tissues. Those who, like myself, studied Surgery before the adoption of the antiseptic system can fully understand how great a blessing the method is to the surgeon and his assistants as well as to the patient; and those of us who studied Surgery in German and French hospitals previous to the introduction of Lister's antiseptic method can well understand how great a blessing it must be to patients in them.

That department of Surgery with which the names of Spencer Wells and Thomas Keith are so intimately associated affords striking illustration of the wonderful success with which some special operations may be conducted, although the older surgeons scarcely dared to attempt them. Sufferers from distant countries came to Edinburgh to avail themselves of Keith's great skill, and we can only regret that the vortex of the great metropolis has withdrawn him from us.

Within the last few years intracranial Surgery has undergone complete renovation. No organ of the body has been so difficult to investigate as the brain. Until some thirty years ago it sat within its bony box enigmatical as the sphinx, and indisposed to reveal to the physiologist its long kept secrets. But its own

weakness and tendency to disease at length divulged to the inquisitive mind of Paul Broca the significant fact, that when a certain portion of the brain is destroyed by disease the recollection of words is lost. That the power of expressing one's self in articulate language should depend on a relatively small portion of the cerebral convolutions was a startling discovery that stimulated others to inquire. Hughlings-Jackson observed that epileptiform convulsions in special groups of muscles may proceed from disease of certain convolutions of the cerebrum. But the precise knowledge we now possess came from the use of electricity as a stimulus to the brain by Fritsch and Hitzig, and David Ferrier. The discoveries made by the German observers, though eminently path-breaking, were completely eclipsed by those of Ferrier, who well deserves all the credit he has received for the accuracy and scope of his experiments and the inferences he deduced from them. As the result of physiological experiment and pathological investigation, we now know that a large portion of the surface of the brain is essentially a sensory-motor mechanism, definite portions of the brain substance emitting the impulses that prompt definite groups of muscles to movement, and other portions being devoted to the reception of impressions from the several organs of sense. By comparing the effects of cerebral disease in man with those of experiment on lower animals, it has been established that a large portion of the human brain consists of sensory and motor centres precisely analogous to those of apes and other higher vertebrates.

To the surgeon and physician these topographical discoveries in the hitherto dark continent of the brain have already proved of great value. If, as a result of cranial fracture, the internal table of the skull be depressed, or blood effused on the brain; if tumours grow from the intracranial membranes, or within the brain substance itself; or if abscesses form, it has—in consequence of these discoveries in cerebral localization—been found possible in a number of cases to accurately diagnose the seat of the morbid condition, to open the cranium precisely over the spot, and by suitably treating the hidden malady to give temporary or permanent relief. By conducting the operations on antiseptic principles, remarkable success has been obtained in cases which twenty years ago would have been regarded as hopeless.

Now turn with me for a little to the department of the physician. The recent successes of brain surgery sink into comparative insignificance before the triumphs of the physician ministering to minds diseased. No department of curative Medicine has made a greater advance than that concerned with the treatment of Insanity. Until nearly the close of the last century the unfortunate old delusion that insanity is due to devils or evil spirits was widely prevalent, and the treatment of the insane was cruel and barbarous in the extreme. To William Tuke of York and

Pinel of Paris we owe the initiation of the rational and humane treatment of the insane now adopted in every civilized country. William Tuke was not a medical man, but a simple citizen—a kind hearted Quaker—who induced the Society of Friends at York to build an asylum where the insane should be treated on humane principles, and their mode of treatment open to inspection. He began his good work in 1792, two years after the death of John Howard, who had done so much to reform the inhuman treatment of prisoners in the gaols of this country and of other European States.

The causes, symptoms, and treatment of the various forms of insanity have now been studied by many learned specialists, and the successful outcome of their work is, that of the 20,000 cases of insanity annually occurring in the United Kingdom, 40 per cent. are curable, while the remaining 60 per cent. of incurables have their stern lot ameliorated by the resources devised by medical skill and kindly forethought. An asylum for the insane is no longer a sort of gaol with gloomy cells and patients chained to the wall, but a quiet retreat within whose walls the troubled mind

> . . . "May find repose.
> No gloomy vengeance lowers;
> Soft pity heals its woes."

When we consider that in the United Kingdom alone upwards of 110,000 persons are afflicted with mental disease, we can readily realize how great a service has been rendered to mankind by the adoption of a rational and humane method of treatment.

But the physician has achieved perhaps even greater success in the department of preventive Medicine. Prevention will, indeed, always be better than cure. Better to keep the enemy out of the citadel than rely upon slaying him after he has entered. If the gates are left open by the neglect of sanitary conditions the enemy is sure to enter. It was not until some sixty years ago that the time became ripe for the development of sanitary medicine. The initial step was the Compulsory Registration Act of 1835, by which it became possible to ascertain in a reliable manner the number of deaths at different ages, and from different diseases, occurring annually in the several towns and districts of the country. The high death-rate of certain towns at once called attention to the causes on which it depended, and, happily for this country, the late Dr William Farr, a man of great ability, was appointed head of the Statistical Department of the Register Office in London. He prepared a national system of vital statistics which has served as a model for all other countries. In a series of letters on the causes of death in England he urged the necessity for inquiry into the sanitary conditions of towns. At length, in 1844, the Government appointed a Commission to inquire into the subject. The late Duke of Buccleuch was chairman; Sir Lyon Playfair,

the late Dr Edwin Chadwick of Leeds, and other eminent men, were members. The Report they issued regarding the sanitary condition of some well-known towns is not pleasant reading, and therefore need not be quoted on this occasion; but it led to the Public Health Act of 1848, giving powers to compel sanitary improvements throughout the country. In the various Medical Schools instruction is now given in the principles and practice of Sanitary Medicine, and now every town and district of the country is in charge of medical men whose sole duty in most cases is the *prevention of disease.* The community owes this great result chiefly to the study of vital statistics by the late Dr Farr, and to the great sagacity of Sir John Simon, Medical Officer of the Privy Council, to Dr George Buchanan of the Local Government Board and others.

Public Health Reports have shown that the air we breathe has a far greater effect on the health than the water we drink or the food we eat. We can refuse to take water or solid food for a time; we can immediately improve their condition by boiling and cooking, and by other suitable devices; but we are compelled, on pain of death, to breathe at every moment the air around us. The provision of an abundant supply of pure water, the inspection of milk and dairies, of meat and other kinds of food, has been of no small service; but of far greater moment has been the purification of the air in the houses of the poor, in schools, in barracks, and other places where human beings congregate. The sanitary arrangements of houses, and the drainage of towns and villages, have all reference more especially to the maintenance of a healthy atmosphere.

The health of some old towns has been greatly improved by destroying insanitary houses, and running wider streets through parts that were too densely crowded and in need of more air. Few towns have profited more by such changes than the city of Edinburgh. Those who visit the city now for the first time are not aware of the great changes in the unhealthy districts of the older part of the town carried out under the enlightened direction of the late Lord Provost Chambers and his Council. These improvements began in 1867, and if the Registrar-General's Death Return for the preceding year be compared with that for 1890, the diminution of disease is most remarkable. Since 1872 the death-rate in Edinburgh has always been lower than in years previous to that date. Dr Farr in his *Vital Statistics* places the normal annual death-rate at 17 per 1000 of the population. During the ten years from 1865 to 1875, the death-rate of Edinburgh was 26·2 per 1000, while during the succeeding ten years it had fallen to 19·9. During the last six years—1885 to 1890 inclusive—it has fallen to an average of 17·5, and during three of these years it was even below 17 per 1000. This remarkable fall in the death-rate is chiefly due to diminution in the number of deaths from

zymotic diseases. Thus in 1866, before the city improvements began and the new water supply was obtained, the deaths from typhus, and typhoid, and scarlet fevers, small-pox and diarrhœa, numbered in all 1584, while last year the total number of deaths from the same diseases was only 182. We therefore owe much to the City Authorities, to the able supervision of the Medical Officer of Health, and to the Sanitary Association. I am not going to make invidious comparisons between the health of this and that of other cities. Much progress has everywhere been made, and although much yet remains to be accomplished in a good many districts, it is permissible to say that the Sanitary Department of State Medicine has in half a century rendered great service to the whole country, and has served as a model for other countries to copy.

Within the last twenty years it has become known that poisons produced by the minute fungi, termed microbes or bacteria, are not unfrequently the cause of disease in man and animals which may assume the dimensions of widespread and deadly epidemics. The leavening of bread, the ripening of cheese, the souring of milk, the putrescence of meat, and a number of diseases such as diphtheria and cholera, typhoid and splenic fevers, and probably also measles, scarlatina, and small-pox, are due to microbes, so is leprosy, tuberculosis, tetanus, and probably hydrophobia, and some other affections. When life comes to a close the microbes that induce putrefactive change soon make their appearance, and like a host of invisible vultures break up the complex bodily system, and effect its gradual dissolution. All these remarkable results are produced by minute protoplasmic specks, invisible save with high powers of the microscope. They were discovered by Leeuwenhoeck two centuries ago, and Linnæus the botanist shortly afterwards suggested that they are probably the cause of fermentation and putrefaction, acute fevers and eruptic disease. It was impossible to test the value of that idea by suitable research until medical science had made many other advances. Although the theory was continually kept in view, it was not until Pasteur began his research on fermentation, and on the disease of silk worms, that bacteriology began seriously to attract the attention of many able researchers to whom we owe the great mass of facts that have rendered it one of the most elaborate departments of pathology.

When the albuminous constituents of our food are brought under the influence of certain ferments *poisons* can be produced. The deleterious qualities of stale fish, mussels, crabs, sausages, and such like, are now known to be due to poisons produced from albuminous matter by the agency of putrefactive microbes. In like manner, some microbes that find entrance to the juices and tissues of the living body can produce poisons that may have a fatal effect upon the individual. They may produce within their own proto-

plasm poisonous alkaloids analogous to those produced by some mushrooms and other poisonous plants; or they may, by fermentative action, produce poisonous globulins and albumoses from the albuminous constituents of the fluids and tissues in which they grow. Thus, Pasteur in his research on the microbe that induces cholera in fowls, discovered that after cultivating the microbe in soup, he could kill the microbe without destroying the poisonous character of its products, which were still able to produce the symptoms of cholera when injected into fowls. That important observation showed that a fluid in which the microbes of disease had grown might still be capable of producing, at all events, the poisonous symptoms of the disease, although the living microbe was no longer there. The same has been proved regarding the microbes of typhoid fever, tetanus, diphtheria, and cholera, and the therapeutist will, no doubt, in the future search for antidotes for the several poisons produced by the microbes in such diseases, so that their deadly effects may be antagonised, while the microbes succumb from other causes.

The researches of the bacteriologist have given a new impetus to preventive Medicine. The necessity for pure water and milk, pure air and cleanliness, has received new emphasis, and the important subject of vaccination has started into greater prominence. It is an old observation that diseases of the zymotic type are not very apt to attack the same person a second time. It was long ago discovered in the East, that if the small-pox virus is introduced under the skin, the disease runs a much milder course than it does if the virus enter in the usual way by mucous membranes, and that the milder disease may procure immunity from further attack. But a far greater service was rendered to mankind when Jenner made the great discovery, that if the human subject is inoculated with virus taken from the cow, immunity from small-pox may be gained by a comparatively trivial affection, or if the vaccinated person is afterwards seized with small-pox the disease is milder and its mortality far less. The statistics of small-pox hospitals show a death-rate of only 6 per cent. in cases of small-pox amongst the vaccinated, but a mortality of from 40 to 60 per cent. amongst the unvaccinated. Although for several reasons it is difficult to get at reliable statistics on this question, there need be no doubt of the great value of vaccination as a preventive measure.

To the bacteriologist Jenner's discovery has been of fundamental importance. The theory commonly entertained regarding cow-pox is that it is a mild form of small-pox, the virus being weakened by growing in the tissue juices of that animal, but in its weakened state still capable of giving the human subject immunity from small-pox. Since it was proved that zymotic diseases result from microbes there has been eager search for the means of altering the character of the microbes and their products, so that

immunity may be gained by inoculation with a weakened virus. Working on this line Professor Greenfield discovered in 1880, that by cultivating the microbes of anthrax in aqueous humour from the eye of an ox for a sufficiently long time, they become so modified that when injected into animals liable to splenic fever they produced a mild type of the disease, and when the cultivation in the same fluid had been continued through many generations of the microbe it lost its power of producing disease. At a later date Pasteur discovered that by simply cultivating the microbe of anthrax at a temperature 7° to 15° Fahr. above that of the blood, it no longer produces in animals the deadly form of splenic fever, but a comparatively mild type which, however, serves to render the animal immune to the graver form. Along the same line Pasteur made his great discovery of the method by which the virus of hydrophobia can be weakened by cultivation in the rabbit and otherwise, and of the manner in which that terrible disease may be, so to speak, baffled by repeated inoculations of the weaker virus before the more deadly virus has had time to develop. How an attack even of a mild form of zymotic disease procures partial or complete immunity from a subsequent attack will no doubt puzzle the pathologist for a long time; but at all events bacteriology has already rendered signal service to practical Medicine, and has stimulated the mind to deeper and deeper thought regarding the hidden problems of disease.

The somewhat extended reference I have made to preventive Medicine compels me to say briefly, that therapeutics, though ever beset with great difficulty, makes sure advance. The old error that a knowledge of the actions of drugs is only to be gained by observing how they act in disease, is now exploded. A whole department of physiological pharmacology has sprung up in which the physiological actions of drugs are studied as a necessary preliminary to the right understanding of their therapeutical effects. The number of useful remedies is now very considerable, and the activity of the chemist is likely to increase their number indefinitely, so that in time the physician will scarcely be able to keep himself in touch with all the resources at his command. The advancement of therapeutics and the ever deepening knowledge of disease has enabled the physician of late years to lessen suffering and ward off danger in a number of maladies, and more especially to ameliorate the lot of those who have fallen victims to tedious and incurable disease, such as affections of the heart and others.

But although medical science has advanced so rapidly in a century, and although great progress is yet to be made, too much must not be expected from the resources of Medicine. The phenomena of life in health and disease depend on intricate causes which science will never be able completely to fathom. No power of science can alter the fixed law of Nature by which every living bodily system must in due time dissolve and disappear. The

highest aim of Medicine can only be to prevent or ameliorate its troubles, and lengthen life to the normal span. No one would thank the physician if he discovered an *elixir vitæ* that would enable a man to live for centuries. He is tired enough of this world by the end of ninety or a hundred years, and if he lived much longer he would find himself a good deal in the way of the on-coming stream of younger life. The continual renovation of life by the succession of new individuals has enabled living Nature slowly to rise to higher and higher attainments in obedience to the Creator's great plan, so that at length his creatures have been empowered to search out the secrets of Nature, and to discover with the help of science how greatly the scope and plan of creation transcends the conceptions of a pre-scientific age.

It must be admitted that the revelations of science are not in harmony with some ideas formulated in pre-scientific times; but the height, and the depth, and the breadth of God's truth has been shown to be far greater than it entered into men's minds to conceive in the earlier ages. But in searching after truth in the light of science, we all of us—the oldest as well as the youngest graduate here present—require to keep humility ever before our minds. We are too apt to mistake the apparent for the real, to forget that we look at Nature in the mirror of our own minds, and seeing her thus dimly, we cannot with our limited powers know the ultimate truth; therefore the question, "What is truth?" will never cease to be asked. The struggle for existence in the world of ideas is as keen as amidst the forms of life. The fittest idea will in the end survive, although it may require centuries to exterminate the weeds of error. In the history of Medicine there have been many errors; it required centuries to exterminate the errors of Galen; there are doubtless many errors to-day.

Graduates in Medicine, you have to-day buckled on your full armour, you will not fail to serve your day and generation in whatever lands your lot may fall. You are all proved men, and we know that you will not fail to bring all the resources of Medicine even to the poorest in the land; that you will do your best to help onward the cause of medical science, and to sustain the reputation of your Alma Mater, in whose name I bid all graduates of to-day a hearty farewell.

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